



Forest Insect & Disease Management

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STATUS AND POST SUPPRESSION EVALUATION OF BALSAM WOOLLY APHID
INFESTATIONS ON ROAN MOUNTAIN, TOECANE RANGER DISTRICT,
PISGAH NATIONAL FOREST, NORTH CAROLINA

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ABSTRACT

The balsam woolly adelgid (Adelges piceae, Ratz.) has caused extensive damage to the Fraser fir (Abies fraseri [Pursh] Poir.) on Roan Mountain since 1962. Due to the scenic value of the fir in this popular recreation area, the trees in certain accessible areas have been protected since 1971 by periodic chemical control of BWA. During July of 1979, a regular annual survey was completed to evaluate the effectiveness of the chemical control program. Plots were established throughout the control areas and data were taken to determine the levels of BWA infestation. The control was found to be effective; it is recommended that it be continued.

INTRODUCTION

Roan Mountain, located on the border between Tennessee and North Carolina, is managed by the Toecane Ranger District of the Pisgah National Forest. It is a popular recreation area, with attractions including the Appalachian Trail, Rhododendron Gardens and Roan High Bluff Overlook.

In 1962, the first BWA infestation on Roan Mountain was detected and the insect has since spread rapidly, threatening over 900 acres of mixed spruce-fir forest in the area. In 1971, the Toecane Ranger District designated three areas for chemical control of BWA, based on accessibility, intensity of visitor use and visibility to the public. A protection area of 200 feet on either side of the road or trail in each of these areas is to be sprayed. One area is treated each year. The three spray areas also provide a protected source for seed collection. This and one other small private ownership are the only known protected areas where Fraser fir seed can be collected.

The protection areas and control schedules are as follows (For location, see figure 1.):

<u>Area</u>	<u>Treatment</u>
1. North Carolina State Road and Rhododendron Gardens	FY - 1977
2. Forest Service Road 130 and 130-A	FY - 1979
3. Appalachian Trail	FY - 1978

The purpose of the 1979 evaluation survey was to determine the level of BWA infestation in each area to assess the effectiveness of the control program.

TECHNICAL INFORMATION

Insect - The balsam woolly adelgid was introduced to North America from Europe around 1900 and was first discovered in the Southern Appalachians in 1957. BWA reproduces by parthenogenesis, with each female producing an average of 100 eggs. The functional life cycle consists of an egg stage, three nymphal instars, and the adult. During the first nymphal stage, the insect is motile and can be dispersed over large areas by wind currents. The adult is stationary and covered with curling, waxy threads, the characteristic protective "wool." The insect overwinters as a dormant nymph, and during North Carolina summers, there may be three to four generations.

Host - BWA infests only true firs, members of the genus Abies. Its hosts in the southeastern United States are Fraser fir and bracted balsam fir (Abies balsamea var. phanerolepsis Fern.).

Damage - BWA infestations are classed as either "crown" or "stem" attack. are less severe: twig gouting and top dieback results, but trees often recover. The stem infestations suffered by Fraser fir usually kill the host within 2-6 years. Mortality is attributed to a salivary substance injected during BWA feeding which causes abnormal cell production and consequent interference with fluid translocation in the tree.

Control - Chemical control procedures consist of the application of 1/8 percent Lindane - water solution along the entire bole and limbs of each tree to the point of runoff using a hydraulic sprayer.

METHODS

Point sample plots (BAF 10) were established at regular intervals along the roads and/or trails in the three protection areas, as follows:

<u>Area</u>	<u>No. of Plots</u>
1. N.C. Road 1348	16
Rhododendron Gardens	4
2. Forest Service Road 130	6
Roan High Bluff Trail	7
3. Appalachian Trail	11
	<u>44 Total</u>

The basal area of each plot as well as the species and total numbers of all included trees were recorded for each plot. Each fir was closely examined for BWA, and information was recorded on crown color and level of infestation, if any. The survey was completed during the third week of July 1979.

RESULTS

The results of the 1979 survey are given in Tables 1 and 2.

Table 1.--Infested Trees by Area

Area 1, Treated FY-1977

	<u>No. trees infested</u>	<u>%</u>	<u>No. trees uninfested</u>	<u>%</u>
N.C. Road 1348	60	30	141	70
Rhododendron Gardens	8	25	24	75
Total	68	30	165	70

Area 2, Treated FY-1979

	<u>No. trees infested</u>	<u>%</u>	<u>No. trees uninfested</u>	<u>%</u>
Forest Service Road 130	5	8	60	92
Roan High Bluff Trail (Not included in spray area)	1	2	74	98
Total	6	5	134	95

NOTE: Data were taken prior to spray application. No data were taken on Forest Service Road 130-A because spraying was already in progress.

Area 3, Treated FY-1978

	<u>No. trees infested</u>	<u>%</u>	<u>No. trees uninfested</u>	<u>%</u>
Appalachian Trail	2	2	115	98

Table 2.--Infested Plots by Area

Area 1, Treated FY-1977

	<u>No. plots infested</u>	<u>%</u>	<u>No. plots uninfested</u>	<u>%</u>
N.C. Road 1348	13	82	3	18
Rhododendron Gardens	3	75	1	25
Total	16	80	4	20

Area 2, Treated FY-1979

	<u>No. plots infested</u>	<u>%</u>	<u>No. plots uninfested</u>	<u>%</u>
Forest Service Road 130	3	50	3	50
Forest Service Road 130-A	2	19	9	82
Roan High Bluff Trail (Not included in spray area)	1	15	6	85
Total	6	25	18	75

NOTE: Data given for Forest Service Road 130-A were taken in 1978.

Area 3, Treated FY-1978

	<u>No. plots infested</u>	<u>%</u>	<u>No. plots uninfested</u>	<u>%</u>
Appalachian Trail	2	19	9	81

DISCUSSION

The results of the 1979 BWA survey on Roan Mountain indicate that the chemical control procedures have been effective. Relatively light infestations (2% of trees sampled were infested) found in the areas sprayed in 1978 demonstrate that the insect is being destroyed, while relatively heavy infestations (30% of trees sampled were infested) found in the areas sprayed in 1977 are evidence of the continuing need for regular insecticide applications.

There are basically two options for management of spruce-fir forests infested by BWA:

1. Gradual conversion to pure red spruce
2. Chemical control

In the designated protection areas, the Fraser fir trees are an important aspect of the aesthetic and recreational experience sought by visitors to the area. The protected trees also provide valuable Fraser fir seeds, which are becoming scarce. They are also accessible to spray equipment. Thus it is recommended that the chemical control program be continued.

The 1980 spray program will be conducted along State Highway No. 1348 Zone and the Rhododendron Gardens, a total of 140 acres.

RECOMMENDATIONS

It is recommended that:

1. A control project be continued for balsam woolly aphid on Roan Mountain.
2. Treatments should include silvicultural management and removal of infested trees, and applying a 1/8 percent solution of Lindane in water with a hydraulic sprayer to the trunk and branches of the tree to the point of runoff.

3. Proposed FY-1980 Control Program

State Highway No. 1348 Zone, Rhododendron Garden (figure 1).

Spray infested fir trees 200 feet of each side of State Road No. 1348 from Carver's Gap to parking lot No. 1; approximately 2 miles to include 90 acres. There is an average of 200 trees per acre that will require treatment. Spray infested fir trees in and around perimeter of Rhododendron Gardens. The area to be treated covers approximately 50 acres with an average of 200 trees per acre. An additional 50 dying trees will need to be cut and removed from the visual influence zone to reduce the infestation.

Summary of Treatment Area:

State Road No. 1348	90 Acres X Trees/Acre 200	18,000 stems
Rhododendron Gardens	50 Acres X Trees/Acre 200	<u>10,000 stems</u>
	TOTAL	28,000 stems